




Concentrator plus / Vacufuge® plus

Operating manual

eppendorf



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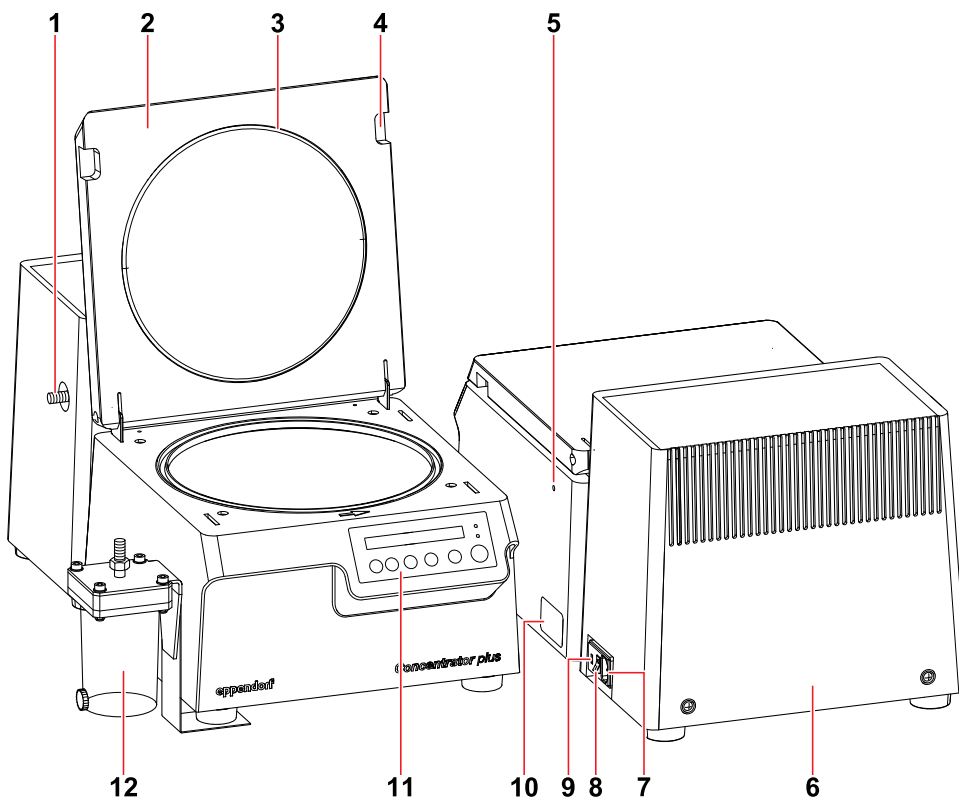


Fig. 1: Front and rear view of the complete system

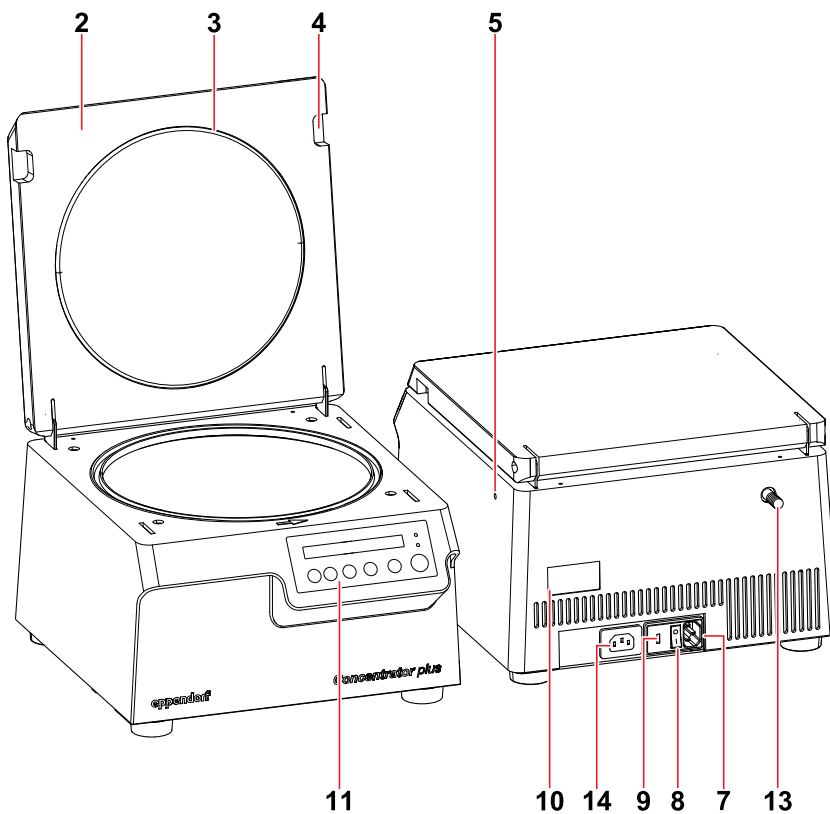


Fig. 2: Front and rear view of the basic device

You can find the description of these figures in chapter 2.1.

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1 User instructions

1.1 Using this manual

- ▶ Before using the device for the first time, please read the operating manual.
- ▶ Please view this operating manual as part of the product and keep it somewhere easily accessible.
- ▶ If this manual is lost, please request another one. The current version can be found on our website, www.eppendorf.com (International) or www.eppendorfna.com (North America).

1.2 Warning signs and hazard icons

| Depiction | Meaning |
|---|---|
|  | DANGER Risk of electric shock with potential for severe injury or death as a consequence. |
|  | DANGER Risk of explosion with potential for severe injury or death as a consequence. |
|  | DANGER Biohazard with potential for risk to health or death as a consequence. |
|  | DANGER Risk of burns. |
|  | WARNING Warning of potential injury or health risk. |
| | CAUTION Refers to risk of damage to property. |
|  | Refers to particularly useful information and tips. |

1.3 Symbols used

| Depiction | Meaning |
|-------------|--|
| ▶ | You are requested to perform an action. |
| 1. 2. | Perform these actions in the sequence described. |
| • | List. |
| Text | Terms from the display of the device. |

1.4 Abbreviations used

| | |
|-------------|---------------------------------------|
| ETFE | Ethylene/Tetrafluorethylene copolymer |
| FFKM | Perfluorelastomer |
| MTP | Microplate |
| PCR | Polymerase Chain Reaction |
| PMMA | Polymethylmethacrylate |
| PTFE | Polytetrafluorethylene |
| rcf | Relative centrifugal force (g-force) |
| rpm | Revolutions per minute |
| UV | Ultraviolet radiation |

2 Product description

2.1 Main illustration

The front fold-out page depicts front and rear views of the complete system (see Fig. 1) and the basic device (see Fig. 2).

| | |
|--|--|
| 1 Pump outlet (complete system) Outlet of the integrated diaphragm vacuum pump, e.g., for hose connection to the emission condenser. | 2 Lid made from PMMA |
| 3 Sealing ring | 4 Grip recess |
| 5 Emergency release | 6 Pump housing (complete system) |
| 7 Power connection | 8 Mains switch |
| 9 Fuse holder | 10 ID plate |
| 11 Control elements and device display | 12 Emission condenser (complete system) |
| 13 Pump connection (basic device) For hose connection to separate vacuum pump. | 14 Power connection for separate vacuum pump (basic device) |

2.2 Delivery package

The delivery includes one of the following device/rotor combinations and the accessories listed below.

2.2.1 Complete system

| Quantity | Order No. (International) | Order No. (North America) | Description |
|----------------|--|------------------------------|---|
| 1 or or | 5305 000.215 5305 000.410 5305 000.614 | - - - | Concentrator plus / Vacufuge® plus complete system 230 V / 50-60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 without rotor with connection, e.g., for a gel dryer, without rotor |
| or or | 5305 000.339 5305 000.738 | 022820109 022820168 | Concentrator plus / Vacufuge® plus complete system 120 V / 60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 with connection, e.g., for a gel dryer, without rotor |
| or or or | 5305 000.231 5305 000.436 5305 000.630 | - - - | Concentrator plus / Vacufuge® plus complete system 100 V / 50-60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 without rotor with connection, e.g., for a gel dryer, without rotor |
| 1 or | 5301 850.249 5417 341.007 | 022654403 022375831 | Fuses 2 x 4.0 AT (230 V) 2 x 6.3 AT UL (120 V / 100 V) |
| 1 | - | - | Mains cable |
| 1 | 5305 900.011 | - | Operating Manual |
| 1 | 5301 330.008 | 022830309 | Emission condenser without hose |
| 1 | 5301 337.002 | 022830295 | Hose for emission condenser (length: 0.7 m) |
| 1 | 5301 110.032 | 5301 110.032 | Gel dryer connection only for 5305 000.614 / 5305 000.738 / 5305 000.630 |

2 Product description

2.2.2 Basic device

| Quantity | Order No. (International) | Order No. (North America) | Description |
|----------|------------------------------|------------------------------|---|
| 1 | 5305 000.010 | - | Concentrator plus / Vacufuge® plus basic device 230 V / 50-60 Hz with rotor F-45-48-11 |
| or | 5305 000.134 | 022820001 | Concentrator plus / Vacufuge® plus basic device 120 V / 60 Hz with rotor F-45-48-11 |
| or | 5305 000.037 | - | Concentrator plus / Vacufuge® plus basic device 100 V / 50-60 Hz with rotor F-45-48-11 |
| 1 or | 5301 850.249 5417 341.007 | 022654403 022375831 | Fuses 2 x 4.0 AT (230 V) 2 x 6.3 AT UL (120 V / 100 V) |
| 1 | - | - | Mains cable |
| 1 | 5305 900.011 | - | Operating Manual |

2.3 Features

Concentrator plus and Vacufuge plus are designed for the evaporation of liquid or wet samples in micro test tubes, round-bottom tubes, Falcon tubes, flat-bottom tubes and different plates.

You can insert the following tubes / plates:

- 1.5 and 2.0 ml micro test tubes in a rotor with 70 places.
- 0.5 ml micro test tubes in a rotor with 72 places.
- 15 ml Falcon tubes in a rotor with 8 places.
- MTP and PCR plates in a swing-bucket rotor.

A complete list can be found in the following chapter (see *Rotors* on page 12).

The device is available as a complete system with integrated diaphragm vacuum pump or, as a basic device without vacuum pump. The basic device can be connected to an external vacuum system.

Every basic device can be upgraded to a Concentrator plus or Vacufuge plus complete system by Eppendorf Service. If required, the complete system can also include a gel dryer connection.

Key, practical functions of Concentrator plus or Vacufuge plus have been optimized:





- 3 temperature levels can be set (30, 45, 60 °C). Alternatively, evacuation is carried out without temperature control.
- The evaporation of liquids can be carried out optimized in 3 functions. In addition to pure evacuation, aqueous and/or alcoholic solutions can be concentrated extra fast with 2 special functions.
- You can also operate the device as a pure desiccator.
- You can connect a solvent trap to the device behind the pump.

Due to the space-saving design, the device can be situated directly on the workstation. With its clearly laid-out display with only a few, clearly marked elements and a display that is easy to read, the device is a pleasant and reliable companion in your daily work.

2 Product description

2.4 Rotors

You can operate the device with the following rotors. Before use, please note the manufacturer's specifications with regard to centrifugation resistance (max. rcf).

| Rotor | Tube | Max. capacity | Tube dimensions (mm) Ø × l and/or l × w × h | Max. rcf / speed (rpm) | Max. load per rotor bore ⁽¹⁾ |
|------------|---|--|--|---|---|
| F-45-72-8 |  | 72 micro test tubes of 0.5 ml each. | 8 × 31 | inner ring: 202 x g / outer ring: 224 x g / 1,400 rpm | 10g |
| F-45-70-11 | | 70 micro test tubes of 1.5/2.0 ml each. | 11 × 41 11 × 47 | inner ring: 153 x g / middle ring: 202 x g / outer ring: 248 x g / 1,400 rpm | 15g |
| F-45-48-11 | | 48 micro test tubes of 1.5/2.0 ml each. | 11 × 41 11 × 47 | inner ring: 217 x g / outer ring: 239 x g / 1,400 rpm | 15g |
| F-45-24-12 |  | 24 round-bottom tubes of 6.0/8.0 ml each. | 12 × 67-100 | 234 x g / 1,400 rpm | 35g |
| F-50-8-16 | | 8 round-bottom tubes of 15.0/20.0 ml each. | 16 × 105-120 | 230 x g / 1,400 rpm | 70g |
| F-50-8-18 | | 8 round-bottom tubes of 15.0/20.0 ml each. | 18 × 105-128 | 230 x g / 1,400 rpm | 70g |
| F-45-8-17 |  | 8 Falcon tubes of 15 ml each. | 17 × 118-123 | 239 x g / 1,400 rpm | 70g |
| F-40-36-12 |  | 36 flat-bottom tubes of 1.5 ml each. | 12 × 32 | 215 x g / 1,400 rpm | 15g |
| F-45-36-15 | | 36 flat-bottom tubes of 3.0/5.0 ml each. | 15 × 45-48 | 217 x g / 1,400 rpm | 20g |
| F-45-16-20 | | 16 flat-bottom tubes of 6.5/10.0 ml each. | 20 × 42-55 | 217 x g / 1,400 rpm | 45g |
| F-40-18-19 | | 18 flat-bottom tubes of 10.0 ml each. | 19 × 66 | 228 x g / 1,400 rpm | 35g |
| F-45-12-31 | | 12 flat-bottom tubes of 20.0 ml each. | 31 × 55 | 226 x g / 1,400 rpm | 55g |
| F-35-8-24 | | 8 flat-bottom tubes of 25.0 ml each. | 24 × 86-90 | 232 x g / 1,400 rpm | 90g |

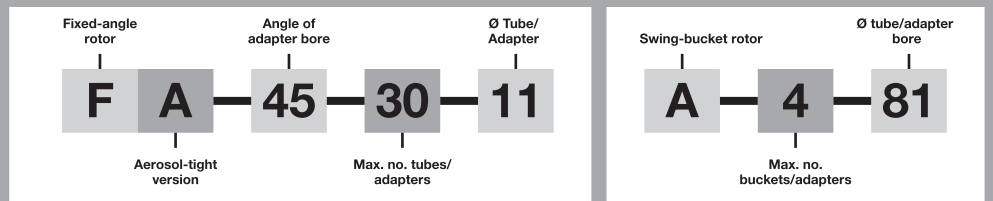
2 Product description

[illegible]

(1) Maximum load per rotor bore for adapter + tube + content.

Rotor code:

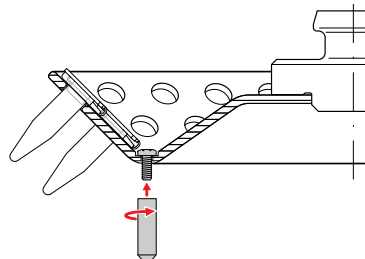
All Eppendorf® rotors are identified using a simple, alphanumeric format that represents the technical specifications in a uniform series of letters and numbers.



2.4.1 Special note on the individual rotors

Rotor F-45-72-8 and rotor F-45-48-11

- You can place two of these rotors on top of each other in any arrangement by using a spacer (order no. Int.: 5301 316.005 / North America: 022822101) and centrifuge at the same time.
- For this combination, lower upper limits apply to the maximum load: bottom rotor: 2/3 of the max. load, top rotor 1/3 of the max. load.
- Included with the accessories are rotor feet which can be attached to the corresponding bores on the rotor using screws. Their purpose is to prevent the samples from being pushed out of the bores when the rotor is put down on the work bench. The rotors can be centrifuged with the rotor feet. The screws must be checked monthly and re-tightened, if required.



Rotor F-45-24-12

- Tube length ≤ 75 mm: max. capacity 24 tubes.
- Tube length > 75 mm: max. capacity 12 tubes.

Rotor A-2-VC

- Tubes, PCR strips and plates without frame can only be used with a suitable work plate (see *Adapters* on page 40).
- Max. loading height: 27 mm.

3 Safety

3.1 Intended use

Concentrator plus and Vacufuge plus are intended for the preparation of samples for clinical diagnostics as well as in routine, training, and research labs in clinics and for scientific purposes. The device may only be operated by trained specialist staff.

Concentrator plus and Vacufuge plus are intended for interior use only and mainly intended for the concentration of aqueous solutions of nucleic acids and proteins in approved sample tubes.



Warning! Poor safety due to incorrect accessories.

The use of accessories and spare parts other than those recommended by Eppendorf may impair the safety, function and precision of the device. Eppendorf accepts no warranty or liability for damage caused by third-party parts or incorrect use.

- ▶ Use only original accessories recommended by Eppendorf.

3.2 User profile

This device may only be operated by trained specialist staff. The operating manual must be read carefully and the operator must have familiarized himself with the working procedures of the device.

3.3 Application limits

Caution! Continuous delivery can affect safe operation of the device.

When delivering liquids continuously, membranes and valves of the vacuum pump can be damaged.

- ▶ Only use the device for applications of limited duration.

3.3.1 Declaration concerning the ATEX directive (94/9/EC)



Risk of explosion!

- ▶ Do not operate the device in rooms where work is being carried out with explosive substances.
- ▶ Do not use this device to process any explosive, radioactive or highly reactive substances.
- ▶ Do not use this device to process any substances, which could create an explosive atmosphere.

Due to their current design and the environmental conditions on the inside of the device, Concentrator plus and Vacufuge plus are not suitable for use in a potentially explosive atmosphere.

The device must therefore only be used in a safe environment, such as in the open environment of a ventilated laboratory or an extractor hood. The use of substances which may contribute to a potentially explosive atmosphere is not permitted. The final decision with regard to the risks connected with the use of such substances is the responsibility of the user.

3.3.2 Maximum service life for accessories

The maximum service life for plastic adapters is 1 year from first commissioning. Do not use the adapter beyond this period!

For the rotors (see *Rotors* on page 12) described here there is no limit for their service life, as long as the following conditions are met: proper use, recommended maintenance and undamaged condition.

3 Safety

3.4 Note on product liability

In the following cases, the protection provided in the device may be impaired. Liability for the function of the device passes to the operator if:

- the device is not used in accordance with the operating manual.
- the device is used outside the sphere of application described here.
- the device is used with accessories and consumables (e.g. tubes and plates), which are not recommended by Eppendorf AG.
- the device is maintained or repaired by persons not authorized by Eppendorf.
- the owner has made unauthorized modifications to the device.

3.5 Warnings for intended use

Before using the device, read the operating manual and observe the following general safety instructions.

3.5.1 Personal injury or damage to the equipment



Danger!

Electric shock from damage to device/power cable.

- ▶ Only switch on the device if the device and the power cable are undamaged.
- ▶ Only use devices that have been properly installed or repaired.



Danger!

Lethal voltages inside the device.

- ▶ Ensure that the housing is always closed and undamaged so that no parts inside the device can be contacted by accident.
- ▶ Do not remove the housing of the device.
- ▶ Do not allow the device to be opened by anyone except service personnel who have been specifically authorized by Eppendorf.



Warning!

Risk from incorrect supply voltage

- ▶ Only connect the device to power sources that match the electrical specifications on the device ID plate.



Warning!

Risk when handling toxic liquids and pathogenic microorganisms.

- ▶ When handling toxic liquids or pathogenic microorganisms of risk category II (see World Health Organization: Laboratory Biosafety Manual) observe the relevant national regulations.



Warning!

Risk of scalding when the device lid is open.

When the heating is switched on, the surface temperature of the rotor chamber can be > 60 °C.

- ▶ Do not touch the walls of the rotor chamber.

Caution!

Damage to device by spilling liquids in the rotor or rotor chamber

1. Switch the device off.
2. Disconnect the device from the power supply.
3. Clean the device and the accessories carefully in accordance with the cleaning and disinfection instructions in the operating manual.
4. If a different cleaning and disinfecting method is to be used, contact Eppendorf AG to ensure that the intended method will not damage the device.

3 Safety

Caution!

Damage to electronic components through formation of condensate.

After the transport of the device from a cool to a warmer environment formation of condensate can occur inside the device.

- ▶ Let the device warm up after transport for a minimum of three hours, before connecting it to the power supply.

Caution!

Poor safety due to missing operating manual.

- ▶ When passing on the device, always enclose the operating manual.
- ▶ If you lose the operating manual, request a replacement. The current version of the operating manual and the safety instructions can also be found on our website www.eppendorf.com.

3.5.2 Incorrect handling of the device



Warning!

Risk of injury from fingers being crushed.

- ▶ When closing the device lid, do not reach between the lid and the device or into the latching mechanism of the lid, as your fingers may be injured.



Warning!

Damage from knocking against or moving the device during operation.

- ▶ Do not move or knock against the device during operation.

3.5.3 Incorrect handling of the rotors



Warning!

Risk of injury from improperly attached rotors.

- ▶ Only operate the device if the rotor has been mounted properly.
- ▶ If there are any unusual noises when the device is started up, the rotor may not be properly attached. Stop the concentration immediately by pressing the start/stop **start/stop** key.



Warning!

Risk of injury from unsymmetric loading of rotors.

- ▶ Load rotors symmetrically with identical tubes and/or buckets and plates.
- ▶ Only load adapters with suitable tubes and/or plates.
- ▶ Always use tubes and/or plates of the same type (weight, material/density and volume).
- ▶ Check for symmetric loading by balancing the adapters and tubes and/or plates used with scales.



Caution!

Risk of injury from overloaded rotor.

The device is designed for the concentration of substances with a max. density of 1.2 g/ml at maximum speed and volume.

- ▶ Note the maximum load capacity for each rotor (adapter, tube and content) per rotor bore and/or per bucket and do not exceed.

3 Safety



Warning!

Risk of injury from corroded or damaged rotors and buckets.

Even minor scratches and cracks can result in serious internal material damage.

- ▶ Protect all parts from mechanical damage.
- ▶ When inserting the buckets in the swing-bucket rotor, ensure that they do not scratch it.
- ▶ Check accessories regularly.
- ▶ Do not use rotors or buckets showing signs of corrosion or mechanical damage (e.g. deformations).



Warning!

Damage to rotors from aggressive chemicals.

Rotors are high-quality components which withstand extreme stresses. This stability can be impaired by aggressive chemicals.

- ▶ Avoid the use of aggressive chemicals, including strong and weak alkali, strong acids, solutions with mercury, copper and other heavy metal ions, halogenated hydrocarbons, concentrated saline solutions and phenol.
- ▶ If the rotor is contaminated by aggressive chemicals, clean it immediately using a neutral cleaning agent. This applies to the base plates of the rotors in particular.

3.5.4 Extreme strain on the sample tubes



Warning!

Risk of injury from overloaded tubes.

- ▶ Note the loading limits specified by the tube manufacturer.
- ▶ Only use tubes which are approved by the manufacturer for the required rcf.

Caution!

Risk from damaged tubes.

Damaged tubes must not be used, as this could cause further damage to the device and the accessories and loss of the samples.

- ▶ Before commencing concentration, carry out a visual check of all tubes for any damage.

Caution!

Hazard to plastic tubes from organic solvents.

When using organic solvents (e.g. phenol, chloroform) the density of plastic tubes is reduced, i.e. the tubes could get damaged.

- ▶ Follow the manufacturer's information about the chemical resistance of tubes.

Caution!

Sample tubes are subject to strong heat.

- ▶ Please note the temperature resistance of the sample tubes.

3 Safety

3.5.5 Vacuum


Warning!
Risk of injury from direct contact with the vacuum.

- ▶ Do not expose any body parts to the vacuum of the device.


Warning!
Risk of injury from overpressure.

Overpressure in the exhaust gas line (e.g. from closed taps or blocked pipes) can cause the pipe to burst.

- ▶ Only use pipes with a sufficiently large cross section.
- ▶ Always keep the exhaust gas line free.
- ▶ Do not place any objects on the exhaust gas lines.
- ▶ Do not flex the exhaust gas line.
- ▶ Do not fit any hose clamps or valves to the exhaust gas lines.
- ▶ Note the maximum pressures and differential pressures permitted (see p. 37).


Warning!
Risk of injury from escaping substances.

No vapors from toxic liquids and pathogenic germs must escape.

- ▶ Ensure that there is sufficient condensation and/or separation of the vapors via suitable cold traps or chemical traps.
- ▶ Please note the personal protective equipment (gloves, clothing, goggles, etc.), extraction and safety class required for the laboratory.

3.6 Safety instructions on the device

| Depiction | Meaning | Location |
|-----------|--|---|
| | General hazard area <ul style="list-style-type: none"> ▶ Follow the operating manual. | Complete system: side of the device next to the power connection. Basic device: rear next to the power connection. |
| | Danger of explosion <ul style="list-style-type: none"> ▶ Do not use this device to process any explosive, radioactive or highly reactive substances. ▶ Do not use this device to process any substances, which could create an explosive atmosphere. | Top of the device |
| | Risk of scalding when the device lid is open When the heating is switched on, the surface temperature of the rotor chamber can be > 60 °C. <ul style="list-style-type: none"> ▶ Do not touch the walls of the rotor chamber. | Top of the device |
| | Risk of injury from overpressure The connection on the top of the emission condenser is intended as an outlet only. <ul style="list-style-type: none"> ▶ Make sure that the emission condenser is connected correctly. ▶ Never shut this connection off. | Top of the emission condenser |

4 Installation

4.1 Selecting location



Warning! If a fault occurs, objects in the immediate vicinity of the devices could get damaged.

- ▶ In accordance with the recommendations of EN 61010-2-020, leave a safety distance of **30 cm** clear around the device during concentration.



Warning! Risk in the event of a fault.

- ▶ Install an emergency switch away from the device so that it can be isolated from the power supply if a fault occurs. The emergency switch should ideally be situated outside of the laboratory or near its exit.

Select the location for the device according to the following criteria:

- Suitable power connection as per the ID plate (230 V/120 V/100 V).
- Stable, horizontal and resonance-free lab bench. Weight of the device: 31/17 kg (complete system/basic device).
- **At least 30 cm** distance to adjoining devices on the sides and **a minimum of 15 cm** at the rear to the wall.
- A well ventilated environment which is protected from direct sunlight to prevent the device from heating up more.
- Ambient temperature during operation: 15 to 35 °C.
- At altitudes above 3,000 ft MSL (risk of insufficient cooling air supply), measures in accordance with DIN EN 60034-1; VDE 0530-1 are required.

4.2 Preparing installation

Requirement

The weight of the device is 31 kg (complete system) and/or 17 kg (basic device). For unpacking and installation you will require another person to assist you.



Keep the packaging and the transport safety devices for later transport or storage. See also the instructions relating to transport (see p. 36).

Perform the following steps in the sequence described.

1. Open the carton.
2. Remove the covering cardboard.
3. Remove accessories.
4. Lift device including the transport securing device out of the carton.
5. Put device including the transport securing device carefully to one side.
6. Push the rear transport securing device at the underside of the device slightly backwards, until the second transport securing screw is visible.
7. Pull off bottom transport securing device.
8. Remove both transport securing screws.
9. Stand device upright.
10. Remove front and rear transport securing device.
11. Remove plastic cover from device and lid.
12. Place device on a stable, horizontal and resonance-free lab bench and let it acclimatize for 3 hours.
13. Check that delivery is complete (see *Delivery package* on page 10).
14. Check all parts for any transport damage. Contact your dealer if any damage is found.

4 Installation

4.3 Installing instrument

4.3.1 General Installation

At the rear fold-out page of this operating manual you can find a schematic representation for possible combinations of the complete system and/or basic devices as well as other components (refer to Fig. 4 and Fig. 5).



Warning! Risk of injury from escaping substances.

No vapors from toxic liquids and pathogenic germs must escape.

- ▶ Ensure that there is sufficient condensation and/or separation of the vapors via suitable cold traps or chemical traps.
- ▶ Please note the personal protective equipment (gloves, clothing, goggles, etc.), extraction and safety class required for the laboratory.



Select a layout for the collection and/or discharge of liquids and gases which corresponds with the current legal requirements and regulations for your application.

Perform the following steps in the sequence described.

1. Place the device on a suitable lab bench.
2. Allow the device to warm up to ambient temperature for at least 3 hours to prevent damage to electronic components from condensation.
3. Connect the components according to your chosen configuration. Please note the relevant instructions in the following chapters.
 - Complete system: Connecting emission condenser (see p. 20).
 - Complete system: Connecting the gel dryer (see p. 21).
 - Basic device: Connecting the vacuum system (see p. 22).
4. Check that the mains voltage and mains frequency comply with the requirements on the ID plate for the device.
5. Connect the device to the power supply and switch on with the mains switch located on the right-hand side of the device (basic device: at the rear of the device) (refer to fold-out page at the front of the manual).
 - Display is active.
 - The lid is unlocked (indicator lamp **lid** lights up).
 - You can now open the lid.

4.3.2 Complete system: Connecting the emission condenser



Please check whether the use of the emission condenser is sufficient for the intended application. For the concentration of chemically aggressive or biologically hazardous substances one of the following measures must be taken:

- Replace the emission condenser with a suitable cold trap or chemical trap.
- In addition, place the emission condenser in an ice bath.
- Attach a hose to the upper connection of the emission condenser and connect it to an extraction system.
- Set up a series connection of cold trap or chemical trap and emission condenser.



The pump of Concentrator plus and/or Vacufuge plus is fully solvent resistant. Therefore, the emission condenser can be placed behind the pump.

4 Installation



Warning! Risk of injury from overpressure.

Overpressure in the exhaust gas line (e.g. from closed taps or blocked pipes) can cause the pipe to burst.

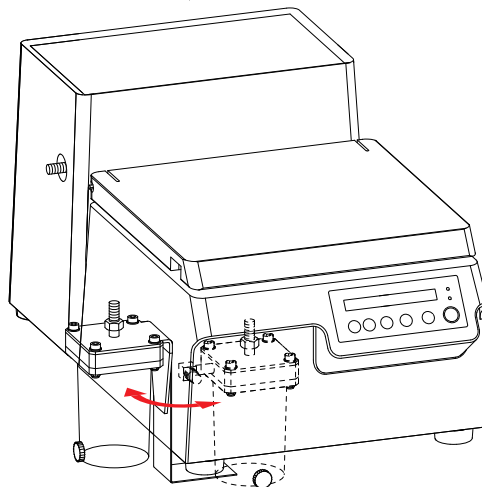
- ▶ Only use pipes with a sufficiently large cross section.
- ▶ Always keep the exhaust gas line free
- ▶ Do not place any objects on the exhaust gas lines.
- ▶ Do not flex the exhaust gas line.
- ▶ Do not fit any hose clamps or valves to the exhaust gas lines.
- ▶ Note the maximum pressures and differential pressures permitted (see p. 37).

1. Remove packaging from the emission condenser.
2. Remove red cap from the upper connection.
3. Screw the angle connection sideways into the emission condenser.



There must be a fall from the pump outlet to the emission condenser inlet to prevent liquid from collecting in the hose.

4. Connect the pump outlet with the connection on the side of the condensate extractor using the hose.
5. Attach the emission condenser from the side or from the front below the front left foot of the device.



6. You can install a filter at the upper connection of the emission condenser. The overpressure at the pump outlet of the complete system must not exceed 1 bar.

4.3.3 Complete system: Connecting gel dryer

Requirement

- 1 connecting hose (length: max. 50 cm, inner diameter: 8 mm, chemical resistant and suitable for vacuum applications).
1. Screw the hose connection supplied (size: G1/4 ") into the thread of the stop valve on the left-hand side of the device.
 2. Connect the gel dryer to the hose connection, using the connecting hose.

4 Installation

4.3.4 Basic device: Connecting vacuum system

The basic device can be connected to a single-phase vacuum pump, a three-phase vacuum pump or a central vacuum system.

General requirements

- Pump can withstand an ultimate pressure of 20 mbar.
- Pump is switched on.
- A separator (e.g., emission condenser, cold trap or chemical trap) between the devices or behind the vacuum system, depending on the application.

Caution! Note solvent properties.

When running several devices in parallel on a vacuum system and/or in combination with a gel dryer, an explosive gas mixture can develop in the vacuum system.

- ▶ Only carry out this parallel operation with identical solvents or solvents which evaporate in a non-hazardous manner.

4.3.5 Connecting single-phase vacuum pump

Requirement

- Power consumption of the vacuum pump: 350 W max.
- Special plug for the control and power supply of the vacuum pump (see *Accessories* on page 40).
- 1 connecting hose (length: max. 50 cm, inner diameter: 8 mm, chemical resistant and suitable for vacuum applications).
- ▶ Connect vacuum pump to the basic device using the special plug and the connecting hose.

4.3.6 Connecting three-phase vacuum pump or central vacuum system

Requirement

- Solenoid valve for the control of the vacuum system via the device (see *Accessories* on page 40).
 - 2 connecting hoses (length: 50 cm max., inner diameter: 8 mm, chemical resistant and suitable for vacuum applications)
1. Connect the solenoid valve to the device and the vacuum system using a connecting hose for each.
 2. Connect the solenoid valve to the basic device for the power supply.
 3. Connect vacuum pump directly to the power supply.



The vacuum system is isolated from the device automatically before concentration is complete by closing the solenoid valve which is piloted by the concentrator. The isolation can also be carried out without a solenoid valve by closing an in-line valve manually (e.g., stop valve with a ground-in stopper).



If you experience any problems during the connection of the vacuum system, please connect Technical Service. You can find the contact addresses at the end of the operating manual or on the Internet under www.eppendorf.com.

5 Operation

5.1 Overview of operating controls

Before using the device for the first time, familiarize yourself with the operating controls and the device display. A depiction of the operating controls and device display can be found on the rear fold-out page (see Fig. 3).

| | |
|---|---|
| 1 Concentration run time 1 min to 9:59 h, infinitely (∞), adjustable in 1 min increments. | 2 Brake function ON : Brake function on. OFF : Brake function off. |
| 3 Temperature --: Heating off. 30/45/60 °C: Heating on. | 4 Mode (see <i>Functions</i> on page 23). |
| 5 Status of the diaphragm vacuum pump (vac) Off: Pump off. On: Pump running. | 6 Status of device lid (lid) Off: Lid locked. On: Lid unlocked. |
| 7 Starting and/or stopping concentration | 8 Setting the mode Manual ventilation of the rotor chamber during a concentrator /desiccator run while the key is pressed and held. The following appears in the display Ventilation . |
| 9 Setting the temperature | 10 Setting the brake function |
| 11 Setting the concentration run time | |

5.2 Functions

Concentrator plus and Vacufuge plus can be used as a concentrator, a desiccator or a centrifuge. For the concentrator and desiccator functions, there are three different modes available for the quick concentration of different solvents:

| Function | Mode | suitable for |
|--------------|---------------------------------------|---|
| Concentrator | V-AQ (vacuum - aqueous) | aqueous solutions |
| | V-AL (vacuum - alcoholic) | alcoholic solutions |
| | V-HV (vacuum - high vapor) | solutions with high vapor pressure |
| Desiccator | D-AQ (desiccator - aqueous) | aqueous solutions |
| | D-AL (desiccator - alcoholic) | alcoholic solutions |
| | D-HV (desiccator - high vapor) | solutions with high vapor pressure and dry substances |
| Centrifuge | CEFU (centrifuge) | centrifugation at 1,400 rpm |

► Before operating the device, press the **mode/vent** key to set the desired function.



If possible, use modes **V-AQ**, **V-AL**, **D-AQ** or **D-AL** and/or occasionally operate the **mode/vent** key during the run.



During operation, you cannot change the set function. Instead, ventilate the rotor chamber during the concentrator or desiccator function, while holding the **mode/vent** key.

5 Operation

5.3 Preparation for concentration

5.3.1 Switching device on



Please note before putting the device into service that the ambient temperature during operation must be between 15 and 35 °C.
At altitudes above 3,000 ft MSL (risk of insufficient cooling air supply), measures in accordance with DIN EN 60034-1; VDE 0530-1 are required.

- ▶ Switch device on, using the mains switch.
 - Display is active.
 - Lid is released (**lid** indicator lamp lights up).
 - You can now open the lid.
 - The parameter settings of the last run are displayed.

5.3.2 Inserting rotor



Warning! Risk of injury from corroded or damaged rotors and buckets.

Even minor scratches and cracks can result in serious internal material damage.

- ▶ Protect all parts from mechanical damage.
- ▶ When inserting the buckets in the swing-bucket rotor, ensure that they do not scratch it.
- ▶ Check accessories regularly.
- ▶ Do not use rotors or buckets showing signs of corrosion or mechanical damage (e.g. deformations).



First note the rotor information (see p. 12) and the special notes on rotors F-45-72-8, F-45-48-11, F-45-24-12 and A-2-VC (see p. 13).

Rotor A-2-VC: remove the buckets before inserting the rotor and pick it up at the rotor cross, using both hands.

Proceed as follows when inserting the rotor.

1. Place rotor on the motor shaft.
2. Push rotor down using slight pressure until you encounter resistance.



The rotors do not need to be screwed in.

5.3.3 Warm-up phase

The diaphragm vacuum pump reaches the displayed output and the ultimate pressure (see *Technical data* on page 37) only after the device has gone through a 15 minute warm up phase. The warm up phase prevents the condensation of liquid in the pump and on the lid of the rotor chamber and therefore prolongs the service life of the pump.



Warning! Risk of injury from fingers being crushed.

- ▶ When closing the device lid, do not reach between the lid and the device or into the latching mechanism of the lid, as your fingers may be injured.

1. **time** arrow keys: Set time to 15 minutes.
2. **brake**: switch brake on or off.
3. **temp**: select temperature.

5 Operation

4. **mode/vent:** select mode **V-AQ**, **V-AL** or **V-HV**.
5. Close lid of the device.
6. Press **start/stop** to start the warm up phase.
 - The device lid is locked, the green indicator lamp **lid** goes out.
 - The rotor starts up.
 - At 1,000 rpm the vacuum pump switches on, the indicator lamp **vac** lights up.
 - The vent valve is closed.
 - The rotor accelerates to the end point of 1,400 rpm.
 - On the display, the colon of the time display flashes while the rotor is turning.
 - The remaining run time is displayed in hours and minutes.

After the warm up phase is completed

- The device stops automatically.
- During braking the elapsed concentration time is displayed flashing.
- The rotor chamber is ventilated so that the pressure in the chamber increases slowly.
- After two seconds, the vacuum pump is switched off, the indicator lamp **vac** goes out.
- Then the device brakes.
- When the rotor stands still, the indicator lamp **lid** lights up.
- The lid can be opened.

5.3.4 Loading fixed-angle rotor

The following notes apply to fixed-angle rotors. The load of the rotor A-2-VC is described in the following chapter (see *Loading swing-bucket rotor* on page 26).



Warning! Risk of injury from unsymmetric loading of rotors.

- ▶ Load rotors symmetrically with identical tubes and/or buckets and plates.
- ▶ Only load adapters with suitable tubes and/or plates.
- ▶ Always use tubes and/or plates of the same type (weight, material/density and volume).
- ▶ Check for symmetric loading by balancing the adapters and tubes and/or plates used with scales.



Warning! Risk from damaged or overloaded tubes!

- ▶ When loading the rotor note the safety instructions with regard to hazards from overloaded or damaged tubes (see *Warnings for intended use* on page 15).

Proceed as follows when loading the fixed-angle rotor.

1. Check the maximum load (tube and content) per rotor bore. Detailed information can be found in this operating manual (see *Rotors* on page 12).
2. Only load rotors with the tubes intended for this purpose.
3. Insert open tubes opposite each other in pairs into the rotor bores. For symmetrical loading, tubes that are opposite each other must be of the same type and contain the same filling quantity.

In order to minimize weight differences between filled sample tubes, we recommend taring with a scale. This will reduce wear on the drive and cut running noise.

5 Operation

5.3.5 Loading swing-bucket rotor

Requirement

- A combination of rotor, bucket and adapter, approved by Eppendorf.
- **Two** inserted buckets.
- Matching and tested tubes and plates.
- Adapters and plates with a total height of ≤ 27 mm.

Caution! Filling the plates too high can cause overflowing.

During centrifugation the menisci in the tubes along the edges of the plates are at an angle. This is due to the centrifugal forces and cannot be avoided.

- ▶ Fill the wells of the plates to a maximum of 2/3 of the max. capacity.



Warning! Risk of injury from unsymmetric loading of rotors.

- ▶ Load rotors symmetrically with identical tubes and/or buckets and plates.
- ▶ Only load adapters with suitable tubes and/or plates.
- ▶ Always use tubes and/or plates of the same type (weight, material/density and volume).
- ▶ Check for symmetric loading by balancing the adapters and tubes and/or plates used with scales.

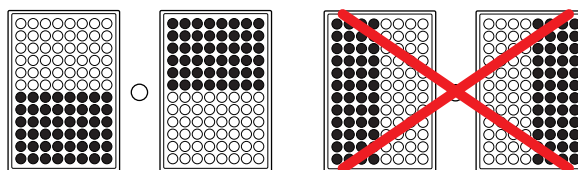
1. Check the bucket grooves for cleanliness and grease lightly with pivot grease (order no. Int.: 5810 350.050 / North America: 022634330).

Dirty grooves and pivots prevent buckets from swinging out evenly.

2. Hang the buckets into the rotor.
3. Check that both buckets are hanging properly and can swing freely.
4. When using a plate type for the first time, carry out a manual loading and settling test.
5. Check maximum load (adapter, plate and content) per bucket.

The relevant details can be found on the rotor and in this operating manual (see *Rotors* on page 12).

6. Load the bucket symmetrically when inserting adapters and plates.



The plate arrangement shown on the right-hand side is incorrect, as the bucket will not swing properly.

The plates have slight play in the buckets.

7. Attach and tighten rotor lid.

5.3.6 Close lid of the device



Warning! Risk of injury from fingers being crushed.

- ▶ When closing the device lid, do not reach between the lid and the device or into the latching mechanism of the lid, as your fingers may be injured.

1. Check that the rotor is attached correctly.
2. Close lid of the device.

5 Operation

5.4 Concentration

Requirement

The prerequisite for all applications described here is the previously described preparation (see *Preparation for concentration* on page 24).



Warning! Risk from incorrectly-loaded rotors and damaged/overloaded tubes!

- ▶ Before starting concentration, follow the safety instructions relating to hazards from unsymmetrically loaded and/or overloaded rotors and from overloaded and/or damaged tubes (see *Warnings for intended use* on page 15).



Warning! Risk of injury from improperly attached rotors.

- ▶ Only operate the device if the rotor has been mounted properly.
- ▶ If there are any unusual noises when the device is started up, the rotor may not be properly attached. Stop the concentration immediately by pressing the start/stop **start/stop** key.

Caution! Overflowing of the emission condenser.

The max. volume of the emission condenser is 280 ml.

1. Check before each run whether the volume of the emission condenser is sufficient for your application.
2. Empty the emission condenser, if required (see *Emptying the emission condenser* on page 29).

5.4.1 Concentration with time setting

Perform the following steps in the sequence described.

1. **time** arrow keys: set running time.
2. **brake**: switch brake on or off.
3. **temp**: select temperature (note temperature resistance of the samples).
4. **mode/vent**: select mode **V-AQ**, **V-AL** or **V-HV**.
5. **start/stop**: start concentration.
 - The device lid is locked, the green indicator lamp **lid** goes out.
 - The rotor starts up.
 - At 1,000 rpm the vacuum pump switches on, the indicator lamp **vac** lights up.
 - The vent valve is closed.
 - The rotor accelerates to the end point of 1,400 rpm.
 - On the display, the colon of the time display flashes while the rotor is turning.
 - The remaining run time is displayed in hours and minutes.

When concentration is completed

- The device stops automatically.
 - During braking the elapsed centrifugation time is displayed flashing.
 - The rotor chamber is ventilated so that the pressure in the chamber increases slowly.
 - After two seconds, the vacuum pump is switched off, the indicator lamp **vac** goes out.
 - Then the device brakes.
 - When the rotor stands still, the indicator lamp **lid** lights up.
 - The lid can be opened.
6. Remove samples.

5 Operation



During the run you can:

- Change the total run time. The new parameters are adopted immediately. Be aware that the shortest new total run time which can be set is the time which has already elapsed plus 2 minutes.
- Adjust the setting of the brake function and the temperature.
- Ventilate the rotor chamber manually by holding the **mode/vent** key. In this way, condensate can be removed from the device lid and the pump and the hose system rinsed.
- Check by means of a stroboscope how far the concentration has progressed.
- Stop concentration before the set run time has elapsed. To do this, press the **start/stop** key.

5.4.2 Concentration with continuous run

Caution! Continuous delivery can affect safe operation of the device.

When delivering liquids continuously, membranes and valves of the vacuum pump can be damaged.

- ▶ Only use the device for applications of limited duration.

Use the continuous run function if you do not want to set a fixed run time.

1. Using the **time** arrow keys, set the continuous run, (∞) can be achieved below **0:01** or above **9:59**.
2. Set all other parameters as previously described (see *Concentration with time setting* on page 27).
3. Press **start/stop** to start concentration.
Time counting is upwards in minute increments.
4. Press **start/stop** to stop the concentration after the required time.
5. The subsequent procedure and process is the same as for concentration with time setting.



If the device runs longer than 9:59 h, **9:59** remains on the display.

5.4.3 Overrun phase

1. After completing the work, let the device run on with the empty rotor for at least one minute.
2. Press the **mode/vent** key for a few seconds to remove any residual condensate from the pump.

5.4.4 Removing the rotor and switching off the device



Rotor A-2-VC: Remove the buckets first before holding the rotor at the rotor cross, using both hands to lift it out of the device.

1. If required, switch off the heating.
2. Remove the rotor.
3. Wipe up any liquid that has been spilled in the rotor chamber and on the device lid, using an absorbent cloth.
4. Clean the rotor chamber and device lid, as described separately (see *Perform cleaning/disinfecting* on page 32).
5. Leave the device lid open and secure it against falling shut to let any remaining residual liquid evaporate.
6. Switch off the device at the main switch.

5 Operation

5.4.5 Emptying the emission condenser

1. Depending on the design, there are two options:
 - **The emission condenser is mounted at the side of the device:** detach the tube from the connection and empty the liquid via the upper connection into a collecting vessel.
 - **The emission condenser is mounted at the front of the device:** here you can alternatively remove the black plug in the vessel using a screwdriver and fit a special tap. Via this tap, you can then empty the liquid directly into a collecting vessel.
2. Dispose of the liquid in accordance with the current legal requirements and regulations for your application.

5.5 Usage notes for rotors

5.5.1 Rotor A-2-VC

Transferring rotor

Caution! If handled incorrectly, the rotor can fall over.

The rotor buckets A-2-VC cannot be used as handles.

- ▶ Before moving the rotor, remove the buckets.
- ▶ Always pick up the rotor at the rotor cross, using both hands.

Caution! Wait for rotor to stop.

When the plates are fully loaded, it can happen during the overrun phase of the A-2-VC rotor that the lid of the device can be opened before the rotor stands still.

- ▶ Always wait until the rotor stands still before opening the lid of the device and removing the plates and/or the tubes.
-

5 Operation

5.6 Special function

5.6.1 Operation as a desiccator

With the desiccator function the rotor chamber is evacuated. However, the rotor is not turned.

You can place the sample tubes directly in the rotor chamber without a rotor or insert them into a rotor.

1. **mode/vent**: select mode **D-AQ**, **D-AL** or **D-HV**.
2. Then proceed as with the concentrator function (see *Concentration* on page 27).

5.6.2 Operation with gel dryer

On a complete system with a gel dryer connection, a gel dryer can be run in parallel to the operation as a concentrator and/or desiccator or used individually.

Caution! Note solvent properties.

When running several devices in parallel on a vacuum system and/or in combination with a gel dryer, an explosive gas mixture can develop in the vacuum system.

- Only carry out parallel operations with identical solvents or solvents that evaporate in a non-hazardous manner.
-

1. **mode/vent**: select mode **V-AQ**, **V-AL**, **V-HV**, **D-AQ**, **D-AL** or **D-HV**.

We recommend the modes **V-HV** and **D-HV**.

If the gel dryer is run individually, you should use modes **D-AQ**, **D-AL** or **D-HV** to protect the drive.

2. In contrast to the concentrator or desiccator function, please open the tap of the gel dryer connection before operation (→ knob points in flow direction) and close it again after operation.

When the gel dryer is operated without concentrator or desiccator function the device lid must also be closed as a vacuum cannot be generated otherwise.

3. Then proceed as with the concentrator function (see *Concentration* on page 27).

5.6.3 Operation as a centrifuge

With the centrifuge function, the rotor is turned. However, the rotor chamber is not evacuated.

1. **mode/vent**: select mode **CEFU**.
2. Then proceed as with the concentrator function (see *Concentration* on page 27).

As there is no vacuum applied in this operating mode, the **mode/vent** key does not have any function during operation.

6 Maintenance

6.1 Service

6.1.1 Device

- ▶ Avoid the drying of saline, aqueous solutions as well as the long-term exposure of acids and alkali on the material (aluminum).
- ▶ Avoid the use of aggressive chemicals, including strong and weak alkali, strong acids, solutions with mercury, copper and other heavy metal ions, halogenated hydrocarbons, concentrated saline solutions and phenol.
- ▶ For the frequent evaporation of corrosive liquids, apply a thin coating of pivot grease to the rotor and rotor chamber (order no. Int.: 5810 350.050 / North America: 022634330).

6.1.2 Pump

The chemical-resistant pump of the complete system does not need to be maintained by the user. However, the valves and diaphragms are subject to natural wear and tear.

- ▶ Remove the condensate regularly from the pump and the hose system by pressing the **mode/vent** key.
This will prolong the service life of the consumables.
- ▶ Observe any changes in the time required for your application. If you notice any deterioration, at the latest, have the valves and diaphragms checked by the authorized service.

6.2 Prepare for cleaning/disinfecting

Clean the accessible surfaces of the device and the accessories at least once a month and if severely contaminated.

Please also follow the instructions on decontamination (see *Decontamination before shipping* on page 33) if you send the device to authorized Technical Service for repair.

The procedure described in the section which follows applies to both cleaning and disinfecting/decontamination. The table below describes the additional steps required.

| Cleaning | Disinfecting/decontamination |
|---|--|
| <ol style="list-style-type: none"> 1. Use a mild cleaning agent to clean the accessible surfaces of the device and its accessories. 2. Perform cleaning as described in the subsequent section. | <ol style="list-style-type: none"> 1. Select disinfecting methods which meet the statutory regulations and guidelines applying to your sphere of application. For example, use alcohol (ethanol, isopropanol) or disinfectants containing alcohol. 2. Perform disinfecting/decontamination as described in the following section. 3. Then clean the device and its accessories. |



If you have any other questions relating to cleaning and disinfecting/decontamination or to the cleaning agents which can be used, please contact Application Support at Eppendorf AG. The contact information can be found on the reverse of this manual.

6 Maintenance

6.3 Perform cleaning/disinfecting



Danger! Electric shock as a result of penetration of liquid.

- ▶ Switch off the device and disconnect it from the power supply before starting cleaning or disinfecting.
- ▶ Do not allow any liquids to penetrate the inside of the housing.
- ▶ Do not disinfect by means of spraying.
- ▶ Only reconnect the device to the power supply once it is completely dry.

Caution when using aggressive chemicals.

Aggressive chemicals may damage both the device and its accessories.

- ▶ Do not use any aggressive chemicals on the device or its accessories, such as strong and weak alkalis, strong acids, acetone, formaldehyde, chlorinated hydrocarbons or phenol.
- ▶ If the device becomes contaminated with aggressive chemicals, clean it immediately with a neutral cleaning agent.

Caution! Corrosion from aggressive cleaning agents and disinfectants.

- ▶ Do not use corrosive cleaning agents, aggressive solvents or abrasive polishes.
- ▶ Do not incubate the accessories in aggressive cleaning agents or disinfectants for prolonged periods.

Caution! Material damage from UV and other high-energy radiation.

- ▶ Do not use UV, beta, or gamma radiation or any other high-energy radiation source for disinfecting.



Autoclave

All rotors, buckets and adapters can be autoclaved (121 °C, 20 min).

1. Switch the device off at the mains switch with the lid open and disconnect the mains plug from the power supply.
2. Remove the rotor. The cleaning procedure for the rotor is described below.
3. Use the previously mentioned agents to clean and disinfect the device and the rotor chamber (see p. 31).
4. Wipe all accessible surfaces of the device and the accessories, including the mains cable, with a damp cloth.
5. Wash off the rubber seals on the housing thoroughly with water.
6. Lubricate the dry rubber seals with glycerin or talc to prevent them becoming brittle. Other components of the device, such as the lid latch must not be lubricated.
7. Clean and disinfect using rotors, buckets and adapters the previously described agents (see p. 31).
8. Rinse rotors, buckets and adapters thoroughly with water.
9. Place the rotors and accessories on a cloth to dry.
10. Check the device and the accessories for corrosion and damage.
11. Mount the dry rotor onto the motor shaft.
12. Fill the fixed angle rotor, if required, with the cleaned adapters and/or the swing bucket rotor with the cleaned buckets and adapters.

6 Maintenance

6.4 Glass breakage



When using glass tubes please note that the risk of glass breakages increases at higher g-forces (rcf) or speeds. Please note the manufacturer's information on the recommended centrifugation parameters (loading and speed).

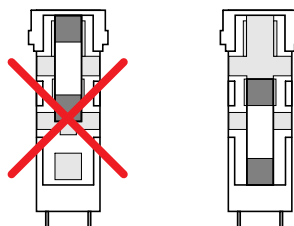
Glass splinters scratch the rotor and bucket surfaces, reducing their resistance to chemicals. Air vortices will then result in very fine black abraded metal in the rotor chamber; in addition to damaging the rotor chamber, rotor, buckets and adapters, this material will also cause samples to become contaminated.

1. In case of glass breakage, carefully remove all splinters and all ground glass from the rotor, the buckets, the adapters and the rotor chamber.
2. If required, replace the adapters to prevent any further damage.
3. Check the rotor regularly for residues or damage.

6.5 Replacing fuses

The fuse holder is behind the flap, next to the mains power socket (see *Main illustration* on page 10).

1. Disconnect the mains plug.
2. Open the flap using e.g., a screw driver.
3. Remove the red fuse holder.
4. Check the fuses.
5. When changing fuses make sure that they are correctly positioned in the fuse holder:



6.6 Decontamination before shipping

If you are shipping the device to the authorized Technical Service for repairs or to your authorized dealer for disposal please note the following:



Warning! Risk to health from contaminated device

1. Follow the instructions in the decontamination certificate. It is available in PDF format on our homepage (www.eppendorf.com/decontamination).
2. Decontaminate all the parts you want to dispatch.
3. Enclose the fully-completed decontamination certificate for returned goods (incl. the serial number of the device) with the dispatch.

7 Troubleshooting

If the suggested measures fail repeatedly, please contact Technical Service. You can find the contact addresses at the end of this operating manual or on the Internet under www.eppendorf.com (International) or www.eppendorfna.com (North America).

7.1 General errors


| Symptom / message | Cause | Remedy |
|-------------------------------------|---|--|
| No display | No mains power connection | ▶ Check mains power connection. |
| No display | Power failure | ▶ Check mains fuse for the device (see <i>Replacing fuses</i> on page 33). ▶ Check mains fuse of the laboratory. |
| Lid of the device cannot be opened. | Rotor still running. | ▶ Wait for rotor to stop. |
| Lid of the device cannot be opened. | Power failure | 1. Check mains fuse for the device (see <i>Replacing fuses</i> on page 33). 2. Check mains fuse for the laboratory. 3. Activate emergency release . (see p. 35). |
| Device cannot be started. | Lid of the device not closed. | ▶ Close lid of the device. |
| Device shakes when it starts up. | Rotor unsymmetrically loaded. | 1. Stop device and load symmetrically. 2. Re-start device. |
| No noticeable concentration | Damaged sealing ring in the lid of the device. | ▶ Insert new sealing ring (see <i>Other accessories</i> on page 41). |
| Pump does not start up. | Pump is overloaded. Thermo switch in the motor winding of the pump triggered. | ▶ Let pump cool down. |
| Pump does not start up. | Overpressure in the exhaust gas line | ▶ Open exhaust gas line. |
| No output | Long, thin hoses | ▶ Select short hoses with a large cross-section. |
| No output | Condensate in the pump | ▶ Let pump run for a few minutes and press mode/vent key several times. |
| Temperature value blinks. | Deviation from emission condensernominal value by $\pm 5\text{ }^{\circ}\text{C}$ | ▶ Let remaining heat from previous run cool down. ▶ Reduce excessive ambient temperature, if applicable. |
| Temperature value blinks fast. | Deviation from nominal value by $+ 10\text{ }^{\circ}\text{C}$ | ▶ Switch off external heat radiators (e.g. halogen lamp). |
| Liquid is collecting in the hoses. | | ▶ Activate ventilation function. ▶ Check fall of the hoses. |

7 Troubleshooting

7.2 Error messages

If one of the following error messages appears proceed as follows:

1. Remove fault (see Remedy).
2. Press **start/stop** key to clear the error message.
3. If required, continue concentration and/or repeat.

| Symptom / message | Cause | Remedy |
|--|---------------------------------|--|
| Error 1 | Drive error | ▶ Contact service. |
| Error 2 Error 3 Error 4 | Drive blocked or stiff. | ▶ Move rotor by hand, remove any obstructions. ▶ Check max. load of rotor. ▶ Check rotor mounting. |
| Error 5 | Drive error | ▶ Contact service. |
| Error 7 | Fault in the lid latch | ▶ Contact service. |
| Error 8 | Fault at the temperature sensor | ▶ Contact service. |
| Error 9 | Electronic fault |  Caution! The rotor chamber temperature can be > 72 °C. ▶ Contact service. |
| Error 10 | Heating defective | ▶ Contact service. |
| Error 12 Error 14 | Electronic fault | ▶ Contact service. |

7.3 Opening the device in case of a power outage

If the device lid cannot be opened during a power outage, you can activate the emergency release manually.



Warning! Risk of injury from rotating rotor if the emergency release is activated.

- ▶ Wait for rotor to stop before activating emergency lid release.



If there is a power outage, the vent valve will open. Before the rotor comes to a full stop, the standard pressure in the rotor chamber will be restored.

1. Disconnect the mains plug.
2. Insert a wire (max. 2.5 mm thick, e.g., a paper clip) in the opening **5** on the right-hand side of the housing (see Fig. 1) and push against the noticeable resistance.
This will release the device lid.
3. Open the device lid slightly.
4. Remove the wire.
5. Open the device lid fully.

8 Transport, storage and disposal

8.1 Transport

- Only transport the device in the original packaging.

| | Air temperature * | Rel. humidity | Air pressure |
|------------------------|--------------------------------|---------------|---------------|
| General transportation | -25 to 60 °C / -10 to 60 °C | 10 to 95% | 30 to 106 kPa |
| Air freight | -40 to 55 °C / -10 to 55 °C | 10 to 95% | 30 to 106 kPa |

*) Basic device / complete system

8.2 Storage

| | Air temperature * | Rel. humidity | Air pressure |
|------------------------------------|--------------------------------|---------------|---------------|
| Device in transport packaging | -25 to 55 °C / -10 to 55 °C | 10 to 95% | 70 to 106 kPa |
| Device without transport packaging | -5 to 45 °C | 10 to 95% | 70 to 106 kPa |

*) Basic device / complete system

8.3 Disposal

In the event of disposing of the product, please observe the applicable legal regulations.

Information on the disposal of electrical and electronic devices in the European Community

The disposal of electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC pertaining to waste electrical and electronic equipment (WEEE).

In accordance with this, any devices delivered after 13/08/2005 on a business-to-business basis, which includes this product, may no longer be disposed of in household waste. To document this they have been marked with the following identification:



Because disposal regulations may differ from one country to another within the EU please contact your supplier if necessary.

9 Technical data

9.1 Power supply

| | |
|------------------------|---|
| Mains power connection | Refer to ID plate 10 (see Fig. 1 or Fig. 2). |
| Power consumption: | Refer to ID plate 10 (see Fig. 1 or Fig. 2). (using largest external vacuum pump permitted) |
| Overvoltage category: | II |
| Fuses: | 4.0 AT (230 V) 6.25 AT (120 V/100 V) |

9.2 Ambient conditions

| | |
|--------------------------|---|
| Environment: | For interior use only. |
| Ambient temperature: | 15 to 35 °C |
| Max. relative humidity: | 75 %, non-condensing humidity |
| Atmospheric pressure: | Use at altitudes up to 6000 ft above MSL. |
| Degree of contamination: | 2 |

9.3 Weight / dimensions

| | 5305 Basic device | 5305 Complete system |
|---------------------|--|---|
| Dimensions: | Width: 320 mm (12.6 in.) Depth: 369 mm (14.5 in.) Height: 230 mm (9.1 in.) | Width: 320 mm (12.6 in.) Depth: 530 mm (20.9 in.) Height: 298 mm (11.7 in.) |
| Weight excl. rotor: | 17 kg (37.5 lbs.) | 31 kg (68.3 lbs.) |
| Noise level: | 50 dB(A) | 50 dB(A) |

9.4 Diaphragm vacuum pump for the complete system

| | |
|---|--|
| Max. current: | 1.4/1.6 A (230 V, 50/60 Hz) 3.0 A (120 V, 50 Hz) 3.6/3.8 A (100 V, 50/60 Hz) |
| Max. power: | 180 W (230/120/100 V) |
| Motor protection: | Thermal winding protection |
| Protection class to IEC 529: | IP 54 |
| Suction capacity (in accordance with DIN EN 60529; VDE 0470-1): | 1.9/2.1 m ³ /h (50/60 Hz) |
| Achievable ultimate pressure (absolute): | 9 mbar |
| Max. permissible pressure at the outlet (absolute): | 2 bar |
| Max. differential pressure between inlet and outlet: | 1 bar |
| Nominal speed at 50/60 Hz: | 1,500/1,800 rpm |
| Radio interference protection class | B |

9 Technical data

Materials for surfaces that are in contact with the medium

| | |
|-------------------------------------|---------------------------------|
| Inner part of housing cover: | PTFE, with carbon reinforcement |
| Head cover, membrane spring washer: | ETFE, with carbon reinforcement |
| Valve: | FFKM |
| Membrane: | PTFE |
| Inlet: | ETFE |
| Outlet: | ETFE |
| Screw connection: | ETFE |
| Hose: | PTFE |

9.5 Application parameters

| | |
|--|--|
| Run time: | 1 min to 9:59 h, infinitely (∞), adjustable in 1 min increments. |
| Speed: | 1,400 rpm, not adjustable |
| Max. relative centrifugal force (rcf): | 248 x g, not adjustable |
| Max. load: | 96 micro test tubes of 2.0 ml each. |
| Permitted density of material to be centrifuged (at max. rcf/speed and max. load): | 1.2 g/ml |
| Emission condenser volume: | 280 ml |

10 Ordering information

10.1 Delivery package

The delivery includes one the following device/rotor combinations and the accessories listed below.

10.1.1 Complete system

| Quantity | Order No. (International) | Order No. (North America) | Description |
|----------------|--|------------------------------|---|
| 1 or or | 5305 000.215 5305 000.410 5305 000.614 | - - - | Concentrator plus / Vacufuge® plus complete system 230 V / 50-60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 without rotor with connection, e.g., for a gel dryer, without rotor |
| or or | 5305 000.339 5305 000.738 | 022820109 022820168 | Concentrator plus / Vacufuge® plus complete system 120 V / 60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 with connection, e.g., for a gel dryer, without rotor |
| or or or | 5305 000.231 5305 000.436 5305 000.630 | - - - | Concentrator plus / Vacufuge® plus complete system 100 V / 50-60 Hz, with integrated diaphragm vacuum pump with rotor F-45-48-11 without rotor with connection, e.g., for a gel dryer, without rotor |
| 1 or | 5301 850.249 5417 341.007 | 022654403 022375831 | Fuses 2 x 4.0 AT (230 V) 2 x 6.3 AT UL (120 V / 100 V) |
| 1 | - | - | Mains cable |
| 1 | 5305 900.011 | - | Operating Manual |
| 1 | 5301 330.008 | 022830309 | Emission condenser without hose |
| 1 | 5301 337.002 | 022830295 | Hose for emission condenser (length: 0.7 m) |
| 1 | 5301 110.032 | 5301 110.032 | Gel dryer connection only for 5305 000.614 / 5305 000.738 / 5305 000.630 |

10.1.2 Basic device

| Quantity | Order No. (International) | Order No. (North America) | Description |
|----------|------------------------------|------------------------------|---|
| 1 | 5305 000.010 | - | Concentrator plus / Vacufuge® plus basic device 230 V / 50-60 Hz with rotor F-45-48-11 |
| or | 5305 000.134 | 022820001 | Concentrator plus / Vacufuge® plus basic device 120 V / 60 Hz with rotor F-45-48-11 |
| or | 5305 000.037 | - | Concentrator plus / Vacufuge® plus basic device 100 V / 50-60 Hz with rotor F-45-48-11 |
| 1 or | 5301 850.249 5417 341.007 | 022654403 022375831 | Fuses 2 x 4.0 AT (230 V) 2 x 6.3 AT UL (120 V / 100 V) |
| 1 | - | - | Mains cable |
| 1 | 5305 900.011 | - | Operating Manual |

10 Ordering information

10.2 Accessories

10.2.1 Rotors

| Order No. (International) | Order No. (North America) | Description |
|------------------------------|------------------------------|---|
| 5490 034.007 | 022822080 | Rotor F-45-72-8 72 positions for 0.5 ml tubes |
| 5490 032.004 | 022822047 | Rotor F-45-70-11 70 positions for 1.5/2.0 ml tubes |
| 5490 030.001 | 022822004 | Rotor F-45-48-11 48 positions for 1.5/2.0 ml tubes |
| 5490 036.000 | 022822144 | Rotor F-45-24-12 24 positions for 6.0/8.0 ml round-bottom tubes (12 x 67-100 mm) |
| 5490 041.003 | 022822233 | Rotor F-50-8-16 8 positions for 15.0/20.0 ml round-bottom tubes (16 x 105 - 120 mm) |
| 5490 042.000 | 022822179 | Rotor F-50-8-18 8 positions for 15.0/20.0 ml round-bottom tubes (18 x 105-128 mm) |
| 5490 038.002 | 022822225 | Rotor F-45-8-17 8 positions for 15 ml Falcon tubes (17 x 118-123 mm) |
| 5490 040.007 | 022822209 | Rotor F-40-36-12 36 positions for 1.5 ml flat-bottom tubes (12 x 32 mm) |
| 5490 035.003 | 022822128 | Rotor F-45-36-15 36 positions for 3.0/5.0 ml flat-bottom tubes (15 x 48 mm) |
| 5490 043.006 | 022822136 | Rotor F-45-16-20 16 positions for 6.5/10.0 ml flat-bottom tubes (20 x 42-55 mm) |
| 5490 037.006 | 022822161 | Rotor F-40-18-19 18 positions for 10.0 ml flat-bottom tubes (19 x 66 mm) |
| 5490 044.002 | 022822217 | Rotor F-45-12-31 12 positions for 20.0 ml flat-bottom tubes (31 x 55 mm) |
| 5490 039.009 | 022822187 | Rotor F-35-8-24 8 positions for 25.0 ml flat-bottom tubes (24 x 86-90 mm) |
| 5490 045.009 | 022822241 | Rotor A-2-VC incl. 2 buckets |

10.2.2 Adapters

| Order No. (International) | Order No. (North America) | Description |
|------------------------------|------------------------------|--|
| 0030 124.235 | 951010031 | Work tray for 96 x 0.2 ml PCR tubes, set of 10 |
| 0030 124.243 | 951010049 | Frame for work tray, set of 5 |
| 5825 706.005 | 022638963 | Adapter used in A-2-MTP and A-2-VC CombiSlide® adapter, set of 2 |
| 5425 715.005 5425 716.001 | 022636260 022636227 | Adapter used in FA-45-30-11, F-45-30-11, F-45-48-11, FA-45-24-11-HS and FA-45-24-11-Kit for 0.2 ml PCR tubes (set of 6) for 0.5 ml tubes and 0.6 ml Microtainer® (set of 6) |
| 5425 723.008 | 022636286 | Adapter used in F-45-72-8 and F-45-36-8 for 0.2 ml PCR tubes (set of 6) |

10 Ordering information

10.2.3 Other accessories

| Order No. (International) | Order No. (North America) | Description |
|------------------------------|------------------------------|--|
| 5301 316.005 | 022822101 | Spacer for simultaneous operation of two rotors for F-45-72-8 and F-45-48-11 |
| 5301 330.008 | 022830309 | Emission condenser without hose |
| 5301 337.002 | 022830295 | Hose for emission condenser (length: 0.7 m) |
| 5301 010.003 | - | Special plug for single-phase external vacuum pump 230 V (Germany), to 400 W, different options upon request |
| 5301 030.004 | 022830112 | Solenoid valve for external vacuum connection Only suitable for aqueous and alcoholic solvents. 230 V, 50-60 Hz, different options upon request |
| 5301 160.005 | 022830201 | O-ring for lid |
| 5810 350.050 | 022634330 | Pivot grease Tube 20 mL |
| 5490 030.800 | 022830520 | Rotor feet for F-45-72-8 and F-45-48-11 Set of 3 |

EG-Konformitätserklärung EC Conformity Declaration

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The product named below fulfills the relevant fundamental requirements of the EC directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Produktbezeichnung, Product name:

Concentrator plus 5305 / Vacufuge plus 5305

Produkttyp, Product type:

Vakuumkonzentrator / Vacuumconcentrator

Einschlägige EG-Richtlinien/Normen, Relevant EC directives/standards:

2006/95/EG, EN 61010-1, EN 61010-2-20

2004/108/EG, EN 55011, EN 61000-6-1, EN 61000-3-2, EN 61000-3-3, EN 61000-4-14



Vorstand, Board of Management:

30.10.2007

Hamburg, Date:



Projektmanagement, Project Management:

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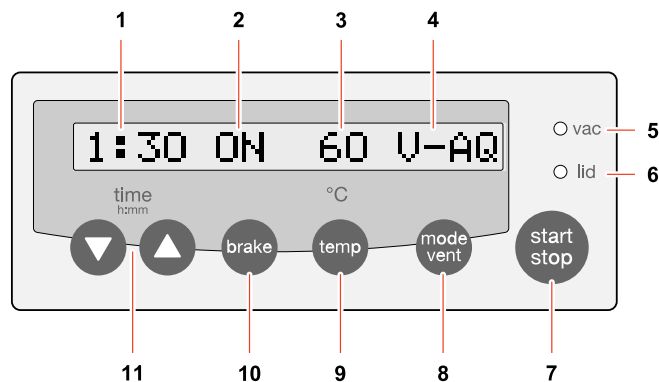


Fig. 3: Operating controls and device display for Concentrator plus and Vacufuge plus

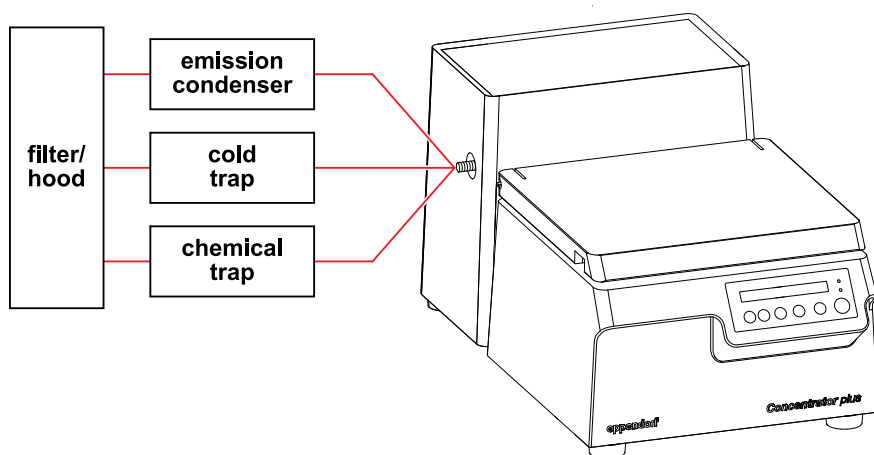


Fig. 4: Connection options for the complete system

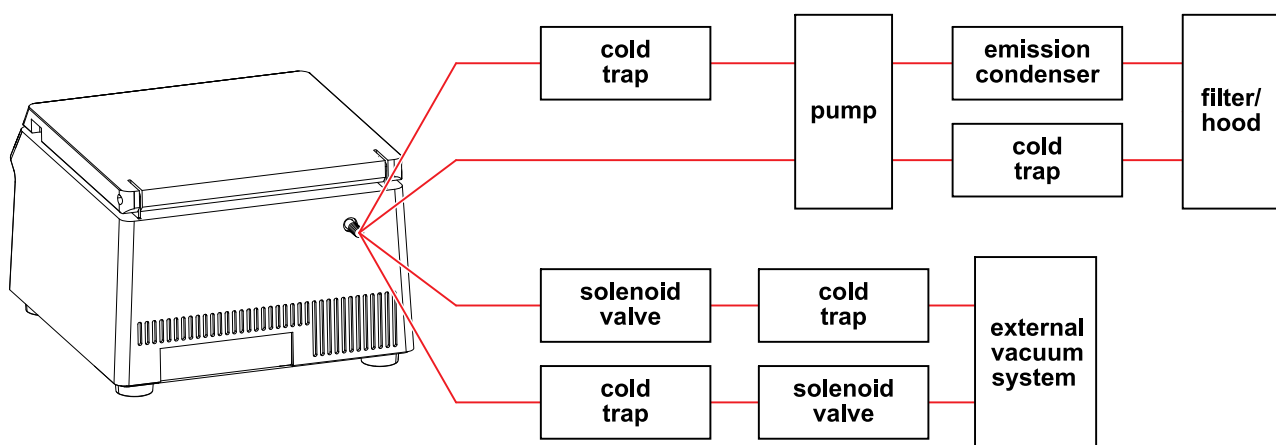


Fig. 5: Connection options for the basic device

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